

Amplifiers



Amplifiers

2010 Amplifier Line Overview

With a heritage of power, performance, and quality that spans many decades, Clarion proudly introduces our most sophisticated amplifier line ever. The entire line offers the kind of power and performance that today's customers demand.

Clarion does not ignore the need for an amplifier to look cool, but we put sound quality and performance at the top of our list. We will not go for musical transparency and control for size or a cosmetic feature. Instead, we embrace the latest in power supply technologies to make our amplifiers simultaneously musical, efficient, and compact.

Clarion amplifiers are developed to compliment one-another in terms of features, performance, and design. These features exist to help installers complete the integration of these amplifiers into a vehicle faster and more accurately. Likewise, these features also help to improve the performance of the amplifier.

XH Series Amplifiers

Model	Class	Description	Power @ 4 Ohms
XH7110	GH	Mono	450 Watts X 1
XH5210	AB	2/1 Channel	90 Watts X 2
XH5410	AB	4/3/2 Channel	90 Watts X 4

XR Series Amplifiers

Model	Class	Description	Power @ 4 Ohms
XR2110	AB	Mono	300 Watts X 1
XR2210	AB	2/1 Channel	60 Watts X 2
XR2410	AB	4/3/2 Channel	60 Watts X 4

2010 Amplifier Technologies

Precise Frequency Selector Electronic Crossover

The inclusion of an electronic crossover in an amplifier allows the speaker to receive the musical information that it can produce properly. This means that sound quality from the speaker is improved and power handling in smaller speakers is increased dramatically.



One drawback of an electronic crossover which allows the crossover frequency to be adjusted through the use of a potentiometer is that it can be difficult to precisely set the crossover frequency. This is because

the potentiometer is nearly infinitely adjustable. Many crossover controls are only labelled at the top and bottom of their frequency range, making selecting a frequency in the middle of the adjustment range nearly impossible.

Clarion provides a simple and elegant solution for accurately setting crossover points with our PFS (Precise Frequency Selector) crossover. The potentiometer on the XH7110, XH5210, and XH5410 amplifiers have 41 detented positions. Using the supplied charts, you can select a specific crossover frequency, then to set it, turn the adjustment potentiometer according number of clicks, and you're done.

One of the many benefits of this feature surfaces when you are building a multiple amplifier system. With conventional (non PFS) crossover controls, you could end up setting a subwoofer amp set to 70Hz when you were aiming for 85Hz and end up at 100Hz on the mids and highs amplifier. The result would be a system that lacks mid-bass dynamics and makes the bass frequencies sound disconnected from the mids and highs. PFS makes under/over-lapping of crossovers history.

Input Voltage Selector Gain Control

Conventional amplifier gain (or sensitivity) adjustment systems have inherent limitations. These controls utilize ganged or stacked potentiometers to allow you to match the power production capabilities of the amplifier to the signal strength of the source unit that is feeding it. To allow an amplifier to be used with as many different sources as possible, the sensitivity range should be as wide as possible.



Because the gain control uses several potentiometers that are connected together (ganged), the exact resistance of each of these devices may not match the next one. The result is one channel of the amplifier will be louder than the other. This is called channel imbalance.

To combat channel imbalance, Clarion has implemented IVS (Input Voltage Selector) technology on the XH7110, XH5210, and XH5410 amplifiers.

IVS dramatically reduces channel imbalance by implementing a switch that controls the gain range: 0-0.6v, 0.6-2v, 2-8v. This switch is used in conjunction with a narrow-range adjustable potentiometer for fine tuning. The result is a reduction in maximum potential channel imbalance, improved imaging, and a more accurate soundstage.

You might be asking yourself: Why not individual gain controls? While individual gain controls can offer very accurate sensitivity settings, an installer **MUST** use an oscilloscope or voltmeter to properly set these controls for accurate channel to channel output. At the very least, the installer could tune the system by ear, but this will require many trips from the listening position back to the amplifier. The decision to implement IVS offers the same results but saves the installer time when setting gains, because fewer tools are required.

Hybrid Class GH Power Supplies

Amplifier efficiency has never been more important than it is in today's modern vehicles. Alternators, batteries, and factory wiring are smaller than ever to produce the lightest and most fuel efficient vehicles possible at the lowest costs.

Clarion's XH7110 amplifier features a Hybrid Class GH power supply. This technology is the result of years of design and testing to offer the optimum balance of sound quality and efficiency - exactly what a Clarion customer demands.

The operation of a Hybrid Class GH amplifier is very simple. Traditional amplifiers use a Class AB output device topology. Essentially, there are a set of switching devices (transistors) for the positive half of the waveform and another set for the negative half of the waveform. These devices operate linearly, passing more current through them as more signal is sent to them. The drawback with Class AB topology is that the output devices operate in their resistive region, rarely fully on or off. This results in a great deal of heat being generated and energy wasted. Around a decade ago, the introduction of Class D amplifiers to the car audio market offered a significant improvement in amplifier efficiency at the expense of sound quality and control. Class D amplifiers operate by cycling the output devices fully on and off very quickly. Adjusting the on versus off time effects a change in output level. One of the many drawbacks of Class D amplifiers is that they require large filtering networks after the output stage to clean up the signal and remove high frequency switching noise. Class D amplifiers can cause significant electrical interference that can affect radio reception.

Clarion's Hybrid Class GH technology is truly the best of both worlds. Clarion's XH7110 amplifier uses a fully analog Class AB audio path. This means tight, controlled, dynamic power output.

How does Hybrid Class GH work to improve efficiency if the audio path is all analog? This of the new Dodge Hemi or Cadillac Northstar engines. These engines

have the ability to shut down a number of cylinders to reduce fuel consumption and heat generation when under light loads. The power supply of a Hybrid Class GH amplifier works in the same way. A micro controller (computer) inside the amplifier controls the output voltage of the power supply. It keeps the voltage just above the output level necessary to reproduce the audio signal. This means that although the output devices are operated linearly, they are almost fully on - it's the power supply voltage that changes. The result is a significant improvement in efficiency without any effect on the amplifier's sound quality.

Strappable Power

The XH7110 amplifier is designed and engineered to allow a pair of XH7110 amplifiers to be used on a single voice coil subwoofer to provide additional power production for extreme SPL levels. This type of interconnection of amplifiers and subwoofer is referred to as "strapping".

Remote Bass Control

The Clarion XH7110 amplifier has the provisions to connect an optional Remote Bass Control module called the BC2. This allows you to control the amplifiers output level from the front of the vehicle. Unlike some competitors products, this is not a bass boost control. This done for optimum sound quality and performance across the entire frequency range, rather than making the bass sound boomy.



Adjustable Subsonic Filter

Clarion's XH7110 amplifier features an adjustable subsonic filter. This filter is adjustable from 10Hz to 80Hz using a potentiometer on the end panel of the amplifier.

When using subwoofers in vented cabinets with high tuning frequencies (above 35Hz), physical power handling of the subwoofer may easily be exceeded. The proper use of a subsonic filter will limit the amount of ultra-low frequency information being passed through to the speaker, as well as reduce the amount of power the amplifier consumes in amplifying those low frequencies.

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Forced Induction Cooling

Clarion's XH-series amplifiers feature forced induction cooling. This is a two-part technology. First, the heatsink design of the amplifier maximizes air flow across the switching devices to hit them with a blast of cool air. Air is then ingested into the core of the amplifier and expelled through the ends of the amp. The second part of Forced Induction Cooling is the computer controlled cooling fan. A thermal sensor connected to the heat sink of the amp combined with programming logic in the amplifiers core decides the appropriate speed for the fan to maximize cooling while minimizing noise.



Mixed-Mode Operation

Clarion 2 and 4 channel amplifiers use an inverting circuit that allows a pair of channels to simultaneously drive multiple satellite speakers in stereo and a subwoofer in a bridged-mono configuration. When used in conjunction with passive crossover components, a Clarion amplifier is capable of mixed mode operation that can power an entire audio system.

Differential Inputs

High impedance differential input stages separate the input signal ground from the common chassis ground. This creates a very effective ground-loop isolation circuit that reduces the possibility of charging system noise entering the signal path. The circuit also compares the signal information on the shield to that of the center conductor and eliminates any common signal (noise), leaving only clear and detailed music.

This advanced circuit topology ensures that Clarion amplifiers will accurately reproduce all the dynamics and subtleties found in today's digital recordings. At the same time, noise suppression circuits work to effectively eliminate induced electrical system noise, contributing to maximum dynamic range.

Clarion recommends the use of twisted-pair RCA interconnects with our amplifiers.

High Impedance Inputs

Clarion amplifiers feature high impedance RCA input stages. This allows source unit with low quality high impedance preamp outputs to provide the best possible frequency and phase response while limiting the effect of interconnect reactances on the amplifiers frequency response.

High impedance inputs also allow you to drive multiple amplifiers from a single set of preamp outputs using Y-cables without as dramatic an effect on signal quality.

Amplifier Circuit Components

Any product is only as good as its weakest link. When Clarion decided to reduce the physical size of the XH and XR series of amplifiers, we knew that this could not be done at the expense of sound quality, performance or reliability.

The decision was made to design these amplifiers for the use of surface mount technology (SMT) devices. SMT devices offer improved tolerances as compared to through-hole devices, and better resist electrical interference from RF or EMI noise.



The result is an amplifier that costs a little more to produce, but sounds better.

Multi-Channel Amplifiers

Clarion's multi-channel amplifiers provide four channels of amplification from one chassis. Each amplifier is equipped with front and rear gain controls and high-/low-pass electronic crossovers. This configuration provides maximum flexibility.

A four channel amplifier is the perfect starting point in terms of an amplifier upgrade. This amplifier is most flexible in terms of system expansion. It can be used to drive four full-range speakers, four full-range speakers and a subwoofer, a mid and tweeter set or more. A four channel amp rarely needs to be replaced as a customers system expands over the years, adding value to the purchase.

CEA-2006 Compliant

The Consumer Electronics Association developed the CEA-2006 standard to provide a level playing field in which amplifier power and S/N Ratio specifications can be compared equally. All Clarion power amplifier specifications adhere to the guidelines of the CEA-2006 specification.

The CEA-2006 specification outlines the following test criteria for amplifier power output testing. Rated power output testing. Rated power shall be measured with all channels driven into a specified load impedance with a distortion level that does not exceed 1%. The amplifier shall produce this power across a specified frequency range (common 20Hz to 20kHz) and be powered by a DC power supply of 14.4V. The S/N Ratio specification is measured with respect to an output equal to 1 Watt, commonly 2V in a mobile audio application.



Product Specifications

Clarion has invested a significant amount of time and expense ensuring that our amplifiers provide the best possible sonic performance and excellent value. A look at the specifications associated with any of our amplifiers quickly demonstrates this dedication to purist performance. From the extended frequency response to the low S/N Ratios and distortion specifications, Clarion amplifiers provide class leading performance.

Clarion takes great pride in the fact that our amplifiers offer frequency response well beyond the audible spectrum. This ensures perfectly linear output with no emphasis in any region. It also moves the phase shift commonly associated with high frequency roll-off out the audible range.

Precise Frequency Crossover Chart

Please use the following charts to set the crossover frequency on the XH5210, XH510, and XH7110 amplifiers.

XH5210 and XH5410

Position	Crossover Frequency
1	49
2	49
3	50
4	50
5	51
6	52
7	52
8	55
9	60
10	65
11	80
12	85
13	90
14	100
15	125
16	140
17	155
18	165
19	175
20	178
21	180
22	200
23	210
24	220
25	230
26	250
27	280
28	300
29	325
30	369
31	410
32	410
33	420
34	455
35	475
36	495
37	510
38	520
39	530
40	540
41	550

XH7110

Position	Crossover Frequency
1	24
2	24
3	24
4	24
5	24
6	25
7	27
8	30
9	33
10	35
11	40
12	43
13	50
14	55
15	60
16	65
17	70
18	75
19	77
20	82
21	86
22	90
23	95
24	100
25	110
26	120
27	125
28	130
29	150
30	155
31	160
32	165
33	175
34	175
35	180
36	180
37	185
38	190
39	195
40	200
41	200

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XH-Series Amplifier On-Board Diagnostics

The XH7110, XH5210, and XH5410 amplifiers feature a computer controlled on-board diagnostics. This chart below outlines the error messages and the causes of the messages.

Amp Illumination	Red End Panel LED	Blue End Panel LED	Cause
ON	OFF	OFF	Amplifier Operating Normal
ON	FLASHING	FLASHING	Thermal Protection Mode
SLOW FLASH	FLASHING OUT OF SYNC	OFF	Input Voltage Overload
FAST FLASH	FLASH IN SYNC	OFF	Short Circuit Detection
THREE FLASHES	THREE FLASHES	OFF	Repeated Short Circuit

Problem: Amplifier is in thermal protection mode.

Solution:

- Shut off the system and allow the amplifier(s) to cool down.
- Check speaker load on amplifier(s), make sure it does not exceed the specifications
- Ensure there is adequate air space around the amplifier.
- Ensure the end panels are not obstructed and limiting the air flow.

Problem: Input Voltage Overload

Solution:

- Service the vehicle's electrical system (alternator, voltage regulator, and battery).

Problem: Short Circuit Detection

Solution:

- Check speaker load on amplifier, make sure it does not exceed specifications.
- Check all speaker wires for short circuits.
- Check all speaker wires for shorts to ground.
- Replace speakers with known good speakers.

Problem: Repeated Short Circuit

Solution:

- Resolve short circuit problems, disconnect the amplifier(s) for 15 minutes to reset.



XH7110

Mono Amplifier, 850 Watts Maximum

- Hybrid Class GH Power Supply
- Class AB Audio Path
- IVS (Input Voltage Selector) Gain Control
- PFS (Precise Frequency Selector)
- Electronic Low Pass Filter (30Hz - 250Hz)
- Adjustable Subsonic Filter
- Variable Bass Boost Control (0 -15dB, 30 - 125Hz)
- Strappable
- Complimentary Sanken Triple Darlington Output Transistors
- MOSFET Power Supply Devices
- Speaker Level Inputs
- Double Sided FR4PC Board
- On-Board Diagnostics
- Gold-Plated RCA, Speaker, and Power Connections
- Illuminated Amplifier Shroud
- Remote Bass Control Ready (BC2 Sold Separately)

Specifications

Number of Channels	1 (Mono)
Frequency Response (+/- 1.0dB)	10Hz to 230Hz
Signal to Noise Ration (CEA-2006)	>63dB
Noise Floor	<1mV
Input Impedance	22k Ohms
Input Sensitivity	0.2 to 6.0V 0.6 to 2.0V 2 to 8V
High Level Input Sensitivity	0.4 to 1.2V 1.2 to 4V 4 to 16V
Bass Boost	0-15dB @ 45Hz

CEA-2006 Power Ratings:

Power Output @ 2 Ohms	850 Watts
Power Output @ 4 Ohms	460 Watts

Dimensions (L X W X H)	16" X 9" X 2 5/8" <i>With End Caps On</i>
	13 1/4" X 9" X 2 5/8" <i>Without End Caps Off</i>



XH5210

2/1 Channel Amplifier, 340 Watts Maximum

- Class AB Audio Path
- IVS (Input Voltage Selector) Gain Control
- PFS (Precise Frequency Selector)
- Electronic High/Low Pass Filter (50Hz - 5.5kHz)
- Bass Boost Control (0 -15dB, 45Hz Fixed)
- Bridgeable and Mixed Mode Operation
- Complimentary Sanken Triple Darlington Output Transistors
- MOSFET Power Supply Devices
- Speaker Level Inputs
- Double Sided FR4PC Board
- On-Board Diagnostics
- Gold-Plated RCA, Speaker, and Power Connections
- Illuminated Amplifier Shroud

Specifications

Number of Channels	2/1
Frequency Response (+/- 1.0dB)	10Hz to 230Hz
Signal to Noise Ration (CEA-2006)	>86dB
Noise Floor	<2mV
Channel Separation	>70dB
THD@ Rated Output	0.05%
Input Impedance	33k Ohms
Input Sensitivity	0.2 to 6.0V 0.6 to 2.0V 2 to 8V
High Level Input Sensitivity	0.4 to 1.2V 1.2 to 4V 4 to 16V
Bass Boost	0-15dB @ 45Hz

CEA-2006 Power Ratings:

Power Output @ 4 Ohms Stereo	90 Watts X 2
Power Output @ 2 Ohms Stereo	160 Watts X 2
Power Output @ 4 Ohms Mono	320 Watts X 1

Dimensions (L X W X H)	12 1/2" X 9" X 2 5/8" <i>With End Caps On</i>
	9 3/4" X 9" X 2 5/8" <i>With End Caps Off</i>

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XH5410

4/3/2 Channel Amplifier, 680 Watts Maximum

- Class AB Audio Path
- IVS (Input Voltage Selector) Gain Control
- PFS (Precise Frequency Selector)
- Electronic High/Low Pass Filter (50Hz - 5.5kHz)
- Bass Boost Control (0 -15dB, 45Hz Fixed)
- Bridgeable and Mixed Mode Operation
- Complimentary Sanken Triple Darlington Output Transistors
- MOSFET Power Supply Devices
- Speaker Level Inputs
- Double Sided FR4PC Board
- On-Board Diagnostics
- Gold-Plated RCA, Speaker, and Power Connections
- Illuminated Amplifier Shroud

Specifications

Number of Channels	4/3/2
Frequency Response (+/- 1.0dB)	10Hz to 230Hz
Signal to Noise Ration (CEA-2006)	>86dB
Noise Floor	<2mV
Channel Separation	>70dB
THD@ Rated Output	0.05%
Input Impedance	33k Ohms
Input Sensitivity	0.2 to 6.0V
	0.6 to 2.0V
	2 to 8V
High Level Input Sensitivity	0.4 to 1.2V
	1.2 to 4V
	4 to 16V
Bass Boost	0-15dB @ 45Hz
CEA-2006 Power Ratings:	
Power Output @ 4 Ohms Stereo	90 Watts X 4
Power Output @ 2 Ohms Stereo	160 Watts X 4
Power Output @ 4 Ohms Mono	320 Watts X 2
Dimensions (L X W X H)	14 3/4" X 9" X 2 5/8"
	<i>With End Caps On</i>
	12" X 9" X 2 5/8"
	<i>With End Caps Off</i>



XR2110

Mono Amplifier, 400 Watts Maximum

- Class AB Audio Path
- Adjustable Low Pass Filter (30Hz to 300Hz)
- Selectable Bass Boost (0dB, 6dB, 12dB)
- MOSFET Power Supply Devices
- Speaker Level Inputs
- Double Sided FR4PC Board
- Gold Plated RCA, Speaker, and Power Connections

Specifications

Number of Channels	1 (Mono)
Frequency Response (+/- 1.0dB)	10Hz to 300Hz
Signal to Noise Ration (CEA-2006)	>70dB
THD@ Rated Output	<0.1%
Input Impedance	22k Ohms
Input Sensitivity	0.2 to 5.5V
Bass Boost	0, 6dB, 12dB

CEA-2006 Power Ratings:

Power Output @ 2 Ohms	400 Watts
Power Output @ 4 Ohms	300 Watts
Dimensions (L X W X H)	12 1/2" X 11" X 2 1/4"



XR2210

2/1 Channel Amplifier, 200 Watts Maximum

- Class AB Audio Path
- Adjustable High/Low Pass Filter (30Hz - 300Hz)
- Selectable Bass Boost (0dB, 6dB, 12dB)
- Bridgeable and Mixed Mode Operation
- MOSFET Power Supply Devices
- Speaker Level Inputs
- Double Sided FR4PC Board
- Gold-Plated RCA, Speaker, and Power Connections

Specifications

Number of Channels	2/1
Frequency Response (+/- 1.0dB)	20Hz to 30kHz
Signal to Noise Ration (CEA-2006)	>85dB
THD @ Rated Output	<0.1%
Input Impedance	22k Ohms
Input Sensitivity	0.2 to 5.5V
Bass Boost	0, 6dB, 12dB

CEA-2006 Power Ratings:

Power Output @ 4 Ohms Stereo	60 Watts X 2
Power Output @ 2 Ohms Stereo	80 Watts X 2
Power Output @ 4 Ohms Mono	180 Watts X 1
Dimensions (L X W X H)	7 3/4" X 11" X 2 1/4"

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XR2410

4/3/2 Channel Amplifier, 400 Watts Maximum

- Class AB Audio Path
- Adjustable High/Low Pass Filter (30Hz - 300Hz)
- Selectable Bass Boost (0dB, 6dB, 12dB)
- Bridgeable and Mixed Mode Operation
- MOSFET Power Supply Devices
- Speaker Level Inputs
- Double Sided FR4PC Board
- Gold-Plated RCA, Speaker, and Power Connections

Specifications

Number of Channels	4/3/2
Frequency Response (+/- 1.0dB)	20Hz to 30kHz
Signal to Noise Ration (CEA-2006)	>85dB
Input Impedance	22k Ohms
Input Sensitivity	0.2 to 5.5V
Bass Boost	0, 6dB, 12dB

CEA-2006 Power Ratings:

Power Output @ 4 Ohms Stereo	60 Watts X 4
Power Output @ 2 Ohms Stereo	800 Watts X 4
Power Output @ 4 Ohms Mono	180 Watts X 2

Dimensions (L X W X H)	12 1/2" X 9" X 2 5/8"
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EQS746

1/2-DIN Graphic Equalizer with Crossover

- 7-Band Graphic Equalizer
- Front Panel Selectable Main/Auxiliary Inputs
- Front/Rear Outputs with Fader and Subwoofer Output with Subwoofer Level Control
- Selectable Subwoofer Low-Pass Frequency at 60 or 90Hz
- 6-Channel/7 Volt RCA Line Level Output
- Auxiliary Input Sensitivity
- Blue Illumination

Specifications

Power Source	14.4V DC
Frequency Response	10Hz to 50k Hz
Signal to Noise Ratio	>100dB
Output Voltage	7.0V RMS
Center Frequencies	50Hz, 125Hz, 315Hz, 750Hz, 2.2k Hz, 6k Hz, 16k Hz
Dimensions (L X W X H)	7" X 1 1/8" X 4 1/16"



MCD360

3-Way Electronic Crossover

- 18dB/Octave Slope-Variable Crossovers
- Front, Rear, and Subwoofer Outputs with Level Controls
- Built-in Bass Equalizer
- Super-Flexible Design
- Remote Subwoofer Level Control
- Crossover-Frequency Multiplier Switch
- 2/4/6 Channel Inputs
- Separate Front and Rear Crossover Points

Specifications

Power Source	14.4V DC
Frequency Response	10Hz to 50k Hz
Signal to Noise Ratio	>100dB
Separation	60dB
High Pass Frequency Range	32Hz to 8k Hz, Front 32Hz to 400Hz, Rear
Subwoofer Equalizer Center Freq.	25Hz to 100Hz
Subwoofer Equalizer Boost	0 - 18dB
Output Voltage	5.0V RMS
Output Impedance	100 Ohms
Input Impedance	20k Ohms
Crossover Slope Rate	18dB/Octave
Crossover Characteristics	Butterworth
Output Gain	1:2 (+6dB)
Distortion	0.001% THD @ 1V
Dimensions (L X W X H)	5 1/2" X 1 3/4" X 5 1/2"